MEMORANDUM

To: Reviewers

Through: Dan Olson, Administrator, Air Quality Division

From: Michael Stoll, Operating Permit Program Manager
Glenn Spangler, Air Quality Engineer

Subject: Draft Chapter 6, Section 3 Operating Permit 30-145 for Sinclair Oil Corporation, Sinclair, Wyoming Refinery

Date: October 29, 2003 ***(Revised 12/15/03)***

Introduction

Attached for review is a draft Wyoming Air Quality Standards and Regulations (WAQSR) Chapter 6, Section 3 operating permit for the Sinclair Oil Corporation, Wyoming Refinery (No. 30-145). The Sinclair, Wyoming Refinery processes low sulfur sweet and higher sulfur sour crude oil using distillation, catalytic cracking, and other techniques to produce asphalt, fuel oil, gasoline, jet fuel, liquified petroleum gas (LPG), and elemental sulfur products for sale under the Standard Industrial Classification (SIC) code 2911 (petroleum refining). The refinery is a major source as defined under WAQSR Chapter 6, Section 3 since the total potential emissions from the refinery for carbon monoxide (CO), nitrogen oxides (NO_X), particulate matter (particulate), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and hazardous air pollutants (HAPs) each exceed the emission thresholds for major source applicability.

Plant Description

The Sinclair, Wyoming Refinery (Sinclair refinery) was constructed in 1923 and is currently owned and operated by the Sinclair Oil Corporation. The refinery has been modified since the original construction, and at the present time, has a capacity of approximately 70,000 barrels per day of crude oil.

Plant operations involve the use of modern process units typically used in petroleum refineries including: atmospheric and vacuum distillation units, hydrotreating units, a reformer unit, a fluidized catalytic cracking unit, a hydrogen production unit, a hydrocracking unit, and an alkylation unit. Additional plant operations include crude oil unloading and desalting; sulfur recovery; product blending, storage, and loading; and facility maintenance. Auxiliary units include three high-pressure boilers and four low-pressure boilers for steam production and a wastewater treatment system.

Process Description

Crude Oil Receiving and Storage

The crude oil processed in the Sinclair refinery arrives via pipeline or by truck. Crude oil shipments received by truck are unloaded using a crude oil unloading rack. After entering the plant, crude oil is sent to storage which consists of four 120,000-bbl storage tanks. Emissions associated with this equipment include fugitive VOC emissions from the crude oil unloading rack and the storage tanks.

Crude Oil Distillation

Crude oil distillation is the first major separation operation in refining. This operation is normally accomplished using a crude unit. A refinery crude unit typically consists of a desalter, an atmospheric distillation tower, a vacuum distillation tower, and other associated equipment. The crude unit produces intermediate hydrocarbon products which are further processed by other refinery units.

Crude Unit Desalter - The crude oil entering the refinery is contaminated to varying degrees with water, salt, and suspended solids (clay, fine sand, etc.). Prior to distillation, these contaminants are removed using a desalting unit. In the desalting unit, the crude oil is heated, mixed with water, and treated to wash away the contaminants.

Crude Unit Atmospheric Distillation - An atmospheric distillation tower is essentially used to boil crude oil at atmospheric pressure. The resulting components, termed fractions, are removed from specific trays inside the tower. Gaseous hydrocarbons, such as methane and ethane, are removed at the top of the tower. Heavier liquid hydrocarbon fractions, termed naphtha, distillates, and gas oils, are removed down the length of the distillation column in order of increasing boiling temperature. The heaviest hydrocarbon fraction, usually termed topped or reduced crude, is removed from the tower bottom.

Crude Unit Vacuum Distillation - Vacuum distillation is used to separate additional hydrocarbon fractions from the reduced crude produced by atmospheric distillation columns. Vacuum distillation columns operate at pressures below atmospheric pressure which lowers the temperatures required to separate the topped crude fractions. This process minimizes the coking and thermal degradation that occurs at higher distillation tower operating temperatures. Vacuum distillation columns produce gaseous hydrocarbons, gas oils, and residuum. Vacuum tower residuum is typically processed into asphalt or petroleum coke.

The crude and vacuum units in use at the Sinclair, Wyoming Refinery include the 581/583 Crude/Vacuum unit and the 582 Crude/Vacuum unit. The emission sources associated with the 581/583 Crude/Vacuum unit include three heaters: the 581 Crude Heater #1, the 581 Crude Heater #2, and the 583 Vacuum Heater (units 18, 19, 20). The emission sources associated with the 582 Crude/Vacuum unit include five heaters: the 582 Pre-Flash Heater-F101, the 582 Crude Heater-F103, the 582 Crude Heater-F102A, the 582 Crude Heater-F102B, and the 582 Vacuum Heater-F104 (units 21, 22, 23, 24 and 25).

Fluidized Catalytic Cracking

A refinery fluidized catalytic cracking (FCC) Unit is typically used to process the gas oil fractions from crude units into hydrocarbon products similar in composition to gasoline and diesel. This is accomplished by heating the gas oil feed and contacting it with catalyst in a reactor. In the reactor, some of the gas oil vaporizes and cracks into lighter hydrocarbons. The cracked hydrocarbons and remaining gas oil are sent to a distillation column for separation. The catalyst, which becomes coated with petroleum coke in the reactor, is sent to the FCC unit regenerator to burn off the coke and is recycled back to the reactor.

The Sinclair refinery operates one FCC unit. The emission sources associated with the unit includes three process heaters, the 780 FCC Heater B2, the 780 FCC Heater B3, and the FCC Heater H2 (units 1,2, and 3), and the FCC Regenerator (unit 9). The FCC unit also contains a fourth heater, the 780 FCC Heater B1, which is utilized only during unit startups. The flue gas from this heater is vented into the FCC Regenerator to heat the catalyst bed and is emitted through the FCC regenerator stack. Subsequently it is not listed as a separate emission source.

Hydrodesulfurization

Naphtha and distillate hydrodesulfurization units are used mainly to remove sulfur compounds from the naphtha and distillate fractions usually removed from a refinery crude unit. In a hydro-desulfurization unit, the naphtha or distillate feedstock is saturated with hydrogen. The hydrogen reacts with the sulfur compounds contained in the feedstock and with part of the feedstock itself to form H_2S, gaseous hydrocarbons, and hydrogenated naphtha and distillate products.

The Sinclair Refinery operates one naphtha hydro-desulfurization unit, the #1-HDS Unit, ***one distillate hydro-desulfurization unit, the #2-HDS unit, and one distillate/gasoil hydro-desulfurization unit, the #3-HDS unit.*** These units contain one emission source each: the 781 #1-HDS Heater, #2-HDS Heater, and the #3-HDS Heater (units 11, 26, and 27).

Catalytic Reforming

A catalytic reformer unit converts the naphtha product from a refinery hydro-desulfurization unit into a higher quality product, termed reformate. The naphtha feedstock is heated, mixed with hydrogen, and fed into a series of reactors containing precious metal catalyst. The molecular structure of the naphtha is rearranged by the reactors. Excess hydrogen, butane, and lighter products are separated from the reactor liquids in a stabilizer distillation column and recovered. The reformate product from the stabilizer is sent to storage and used as a high-octane gasoline blend stock.

The Sinclair Refinery 781 Reformer Unit contains four emission sources: the 781 #1 Reformer Heater (unit 13), the 781 #2 Reformer Heater (unit 14), the 781 #3 Reformer Heater (unit 15), and the 781 Stabilizer Heater (unit 16).

Alkylation & Polymerization

Olefins are petroleum hydrocarbons such as ethylene and propylene containing double-bonded carbon atoms. An alkylation unit combines an olefin feedstock with a stream of isobutane in the presence of a sulfuric acid catalyst to make a gasoline range product called alkylate. The Sinclair Refinery Alkylation Unit contains three process heaters the Alky Heater B15 (unit 32), the Alky Heater B16 (unit 33), and the Alky Heater H1 (unit 34).

The Alkylation Unit also contains a polymerization plant designed to convert propylene to high-octane gasoline range material. The Polymerization Plant contains four reactors each containing a phosphoric acid based catalyst. There are no emission sources associated with this process.

Amine Unit

At the Sinclair Refinery an amine unit is used to remove H_2S from sour (i.e. hydrogen sulfide rich) fuel gas prior to use in refinery fuel fired equipment such as heaters and boilers. The H_2S rich gas (i.e. amine acid gas) from the Amine Unit is sent to the refinery sulfur recovery units for further processing.

Sour Water Stripper

The permittee operates a 140 gallon per minute (GPM) Sour Water Stripper (SWS) at the refinery to remove H_2S and NH_3 from the wastewater produced from various units in the refinery. The SWS strips the dissolved H_2S and NH_3 contaminants from the wastewater by contacting it with clean gas in a stripping tower. The resulting off-gas from this process typically contains 20 to 40 percent H_2S by volume and is sent to the sulfur recovery unit for further processing. The treated water from the unit is reused or is discharged into the refinery oily water system for further treatment.

Sulfur Recovery Units #1 and #2

The permittee operates two sulfur recovery units (SRUs) at the refinery: the 27.7-LTPD Sulfur Recovery Unit #1 (unit 38) and the 20-LTPD Sulfur Recovery Unit #2 (unit 39). Each unit is a three-stage Claus unit designed to recover sulfur from Amine Unit acid gas. Sulfur Recovery Unit #2 also treats the off-gas from the SWS. The end product produced from each unit includes elemental sulfur. The company is currently upgrading the sulfur recovery units to meet performance standards for new sources and emissions standards for hazardous air pollutants that were recently promulgated.

Petroleum Loading and Unloading Racks

The permittee operates a number of Petroleum Loading and Unloading Racks (units 43 and 43B) at the Sinclair Refinery for loading refinery products into or unloading petroleum liquids from trucks and railcars. These units include the following: the Crude Unloading Rack (truck), Light Oil Loading Rack (truck/railcar), Heavy Oil Loading Rack (truck/railcar), Alky Plant Loading and Unloading Racks (truck/railcar), Gasoil Loading and Unloading Rack (truck), Light Cycle Oil Loading Rack (truck), Light Straight Run Loading Rack (truck), and Methanol Unloading Racks (truck/railcar).

Asphalt Heaters

The permittee operates four Asphalt Heaters #1, #2, #3, and #4 (units 28, 29, 30, and 31) at the refinery for heating asphalt and heavy oil to allow for material transport and storage. The heaters are fired with refinery fuel gas and/or natural gas.

Boilerhouse

The permittee operates seven boilers to produce process steam for use in the refinery production units. These boilers include four Low Pressure Boilers (unit 42) and three high pressure boilers including the #8, #9, and #10 High Pressure Boilers (units 40, 41, and 35). All boilers except the #10 High Pressure Boiler are fired using natural gas, refinery fuel gas, and/or fuel oil. The #10 High Pressure Boiler is fired using natural gas or refinery fuel gas. The flue gas from the Low Pressure Boilers are emitted from a common stack while the flue gas from the high pressure boilers are emitted from individual stacks. The boiler house also houses an emergency backup diesel generator, the #5 Generator (unit 49), for operation during electrical power outages.

Flare System

The permittee operates one elevated (vertical) flare (unit 37), which serves as primary relief, a horizontal ground flare (unit 36A) which provides additional relieving capacity and the light oil loading rack flare (unit 43B). In the event the vertical flare is shut down for maintenance, the tulip field flare (unit 36B) is available for use.

Oily Water System

Wastewater produced from the Sinclair Refinery process equipment is treated by the refinery Oily Water System (unit 45) prior to discharge. The system consists of the oily sewer system, oil recovery system, the separator tank system, and aggressive biological treatment unit.

Hydrocracking Unit

The refinery HC Unit functions in a similar capacity as the FCC Unit. The HC Unit cracks a desulfurized gasoil feedstock from the crude units using hydrogen from the H_2 Plant and a fixed catalyst bed, forming petroleum liquids suitable for gasoline blending and gaseous hydrocarbons. The HC Unit utilizes four heaters, including: the HC Heater H1/H2 (unit 50), the HC Heater H3 (unit 51), the HC Heater H4 (unit 52), and HC Heater H5 (unit 57).

The H_2 Plant constructed under Phase I is designed to produce 26 MMCFD of hydrogen through a process that combines natural gas and steam in a heated reactor. The hydrogen produced by the plant is used in the HC Unit and HDS units. The H_2 plant contains one heater, the H_2 Plant Heater H-101 (unit 53), which will be the sole emission source.

Permit History

Construction, modification, and operation activities at this facility which have required an air quality permit or were waived of permitting requirements are briefly described below.

CT-77 (1/14/77): The Division issued permit CT-77 January 14, 1977 for the installation of an atmospheric and vacuum crude oil distillation unit. The new emission sources considered in the permit include four gas/oil fired heaters with firing rates ranging from 17.0 to 35.0 million British Thermal Units per hour (MMBtu/hr). The permitted units include: the 582 Preflash Crude Heater - F101 (unit 21), the 582 Preflash Crude Heater - F103 (unit 22), the 582 Crude Heater - F102A (unit 23), and the 582 Crude Heater - F102B (unit 24). The permit was issued without source-specific permit requirements and has been superseded by other later issued permits.

EPA Permit (4/18/77): The United States Environmental Protection Agency (EPA) issued a permit April 18, 1977 for the refinery expansion permitted under Division permit CT-77. The permit does not reflect the current permitted operation of the four heaters and has been superseded by later issued permits.

CT-162 (9/14/78): The Division issued permit CT-162 September 14, 1978 for the construction of an alkylation unit at the refinery. The new emission sources considered in the permit include the Alky Heater B15 (unit 32) and Alky Heater B16 (unit 33) rated at 14.5 MMBtu/hr and 47.8 MMBtu/hr, respectively. Both units are fired using refinery fuel gas. The permit was issued without source-specific permit requirements and has been superseded by later issued permits.

MD-84 (4/6/88): The Division issued permit MD-84 April 6, 1978 for the construction of the 781 #2 Reformer Heater (unit 14) at the reformer unit and the installation of the 583 Vacuum Heater (unit 20) at the 583 vacuum distillation unit. These units were permitted for refinery fuel gas firing at a rate of 31.3 MMBtu/hr and 35.0 MMBtu/hr, respectively. The permit requirements have been superseded by later issued permits.

CT-831 (4/21/89): The Division issued permit CT-831 April 21, 1989 for the construction of nine petroleum storage tanks at the refinery. The constructed storage tanks range in size from 30,000 to 120,000 barrels (bbl) and store various petroleum and other liquids including asphalt, gasoline, and distillates. The permitted storage tanks include the following: tank #♣s 314, 498, 499, 500, 507, 531, 532, and 540. The permit noted the applicability of 40 CFR 60 Subpart K to tank # 507 and Subpart Ka to tank #♣s 531 and 532. Compliance with specific storage tank roof and seal requirements from each subpart was required by the permit.

MD-116 (12/11/89): The Division issued permit MD-116 December 11, 1989 for an increase in the maximum firing rate for the 781 #2 Reformer Heater (unit 14) from 31.3 MMBtu/hr to 48 MMBtu/hr. The permit requirements have been superseded by later issued permits.

CT-962 (2/14/92): The Division issued permit CT-962 February 14, 1992 for the construction of three gasoline storage tanks. The constructed storage tanks include tank #s 407, 408, and 409 which are designed to contain up to 25,000, 96,000, and 25,000 bbl of gasoline, respectively. The permit noted the applicability of 40 CFR 60 Subpart Kb to each tank and required compliance with the applicable subpart requirements, but contained no other source-specific permit conditions. This requirement has been restated in permit MD-410 issued June 1, 1999 and is thereby superseded.

CT-1022 (2/17/93): The Division issued permit CT-1022 February 17, 1993 for the construction of a 11,500-bbl/day hydro-desulfurization (HDS) unit, a 140-gal/min sour water stripping unit, and a 20 long-ton-per-day (LTD) sulfur recovery unit (SRU) at the refinery to produce low sulfur diesel. Since the issuance of this permit, the permittee has received two new permits for the phased construction of additional process equipment to increase the refinery capacity. The requirements of these later issued permits supersede all permit CT-1022 requirements upon commencement of operation of the first phase units (Phase I).

Permit Waiver (9/10/93): The Division issued a permit waiver September 10, 1993 for construction of a 3400-bbl storage tank (tank # 41). The waiver required that the storage tank be equipped with an internal floating roof and store only No. 5 fuel oil.

Permit Waiver AP-G86 (1/16/96): The Division issued a permit waiver January 16, 1996 for construction of a 33.0-MMBtu/hr gas-fired heater at the HDS unit. The new heater replaced a smaller 18.2-MMBtu/hr unit that was destroyed by fire. The waiver contained no source-specific requirements.

Permit Waiver (11/26/96): The Division issued a permit waiver November 16, 1996 for the on-site relocation of an existing 875-bbl storage tank (tank # 316) and for the subsequent storage of a red dye/kerosene mixture in the tank. As a condition of waiver issuance, the Division required the permittee to comply with the recordkeeping requirements of 40 CFR 60 Subpart Kb 60.116b. This waiver was superseded by a Division waiver issued April 17, 1997.

Permit Waiver (12/3/96): The Division issued a temporary permit waiver January 16, 1996 for a 160 barrel-per-day (bbl/d) increase in fuel oil consumption for the refinery #8 and #9 High Pressure boilers (units 40 and 41) and the Low Pressure Boilers (unit 42) located at the refinery boiler house. The waiver expired January 1, 1998.

Permit Waiver (4/17/97): The Division issued a permit waiver April 17, 1997 for the construction of an 45,500 gallon (gal) storage tank for storing a red dye/kerosene mixture. The permittee abandoned the planned relocation of an existing 875-bbl storage tank considered in an earlier Division waiver issued November 26, 1996 and instead purchased a used 45,500-gal tank. This waiver supersedes the November 26th waiver and, as a condition of issuance, required the permittee to comply with the recordkeeping requirements of 40 CFR 60 Subpart Kb 60.116b.

MD-356 (4/27/98): The Division issued permit MD-356 April 27, 1998 to replace an existing, uncontrolled light oil loading rack with a new 4200 gallon per minute (gal/min) loading rack controlled by a 34 thousand standard cubic foot per hour (MSCFH) incinerator. The permit noted the applicability of 40 CFR 63 Subpart CC to the loading rack and required compliance with the applicable subpart requirements.

MD-410 (6/1/99): The Division issued permit MD-410 June 1, 1999 for the construction of a hydrocracking (HC) unit and an associated hydrogen (H_2) plant, the replacement of an existing reformer, and the replacement of five existing compressor engines with an electric compression system. The permitted construction was to occur in two phases, Phase I and Phase II, and would have increased refinery crude oil throughput from 60,000 to 74,000 bbl/d. Phase I construction included installation of the HC unit, the H_2 plant, and the electric compression system. Phase II construction was to consist of replacing the existing reformer unit with a continuous catalytic reformer (CCR) unit; but was never initiated. The significant source-specific applicable requirements from this permit are summarized below.

- Reference method emission testing for the HC H1/H2, H3, and H4 heaters (units 50, 51, and 52) and the H_2 Plant Heater H-101 (unit 53) to assess compliance with emission limits.

- The replacement of the existing gas fired fluidized catalytic cracking (FCC) unit compressors with the electric compression system prior to the commencement of operation of the Phase I units.
- The installation and operation of ambient air monitoring equipment for sulfur dioxide (SO_2) and quarterly reports of the generated data.
- Operation of all affected heaters and boilers in accordance with the applicable provisions of Chapter 5, Section 2 and 40 CFR 60 Subpart J, including the 0.1 grains per dry standard cubic foot (gr/DSCF) H_2S concentration limit for the fuel gas fired in each unit.
- Operation and maintenance of an H_2S fuel gas monitor for the refinery low and high pressure fuel gas lines in accordance with the applicable provisions of Chapter 5, Section 2 and 40 CFR 60 Subpart F and the submittal of quarterly excess emission reports.
- For the 780 FCC Regenerator (unit 9):
  - An annual SO_2 emission limit of 811 TPY,
  - Installation and certification of NO_x and SO_2 continuous emission monitors (CEMs) and a flow rate monitor prior to commencement of operation of the Phase I units,
  - Operation and maintenance of the above CEM systems to determine compliance with the applicable hourly emission limits and compliance with the quality assurance requirements of 40 CFR 60 Appendix F.
  - The submittal of a quality assurance program for the CEM systems for Division approval.
  - Monthly SO_2 emission reports including year-to-date emissions, and
  - Quarterly excess emission reports for the required monitoring.
- For the #1 and #2 SRUs (units 38 and 39):
  - Maximum sulfur input limits of 27.7 and 20.0 LTPD, respectively,
  - Minimum sulfur recovery efficiencies of 93 and 95 percent, respectively,
  - A requirement to operate the #1 SRU at or near the design sulfur input capacity of 27.7 LTPD during periods the #2 SRU is out of service,
  - Daily recordkeeping of the amount of sulfur produced by each unit,
  - Operation and maintenance of the SO_2 monitors and associated equipment installed on the #1 and #2 SRUs to determine emissions from each unit on a lb/hr basis and compliance with the monitor requirements in 40 CFR 60 Appendix F, and
  - Quarterly excess emission reports for the required monitoring.
- For the #8 and #9 High Pressure boilers (units 40 and 41) and the Low Pressure Boilers (unit 42):
  - A requirement that fuel oil use at the refinery be limited solely to these units,
  - A 105,850 barrel per year (bbl/y) fuel oil usage limit,
  - A fuel oil sulfur content limit of 4 percent by weight,
  - A combined annual SO_2 emission limit (bubble limit) of 776 TPY for all boilers,
  - Required monitoring of fuel oil and fuel gas usage at the boiler house every four hours using fuel gas meters and the down-gauging method for fuel oil, and
  - Monthly reports of the required monitoring and any exceedances of the SO_2 emission limits or the fuel oil sulfur content limit.

- Compliance with the applicable requirements of Chapter 5, Section 2 and 40 CFR 60 Subpart QQQ for the new wastewater collection system servicing the HC unit, H_2 Plant, and the crude oil desalters for the 581 and 582 Crude units.
- Upon startup of the Phase I units, implementation of a leak detection and repair (LDAR) program equivalent to 40 CFR 60 Subpart GGG requirements for all equipment not subject to 40 CFR 63 Subpart CC, 40 CFR 60 Subpart GGG, nor in heavy liquid service as defined in 40 CFR 60 Section 60.481.
- A requirement that the new HC and CCR unit flares be designed, constructed, and operated smokeless in accordance with Chapter 5, Section 2.
- A requirement to determine the total annual benzene quantity from facility waste according to 40 CFR 61.355(a)(4)(ii) subsequent to the startup of new equipment.
- Compliance with all applicable requirements of Chapter 5, Section 3 and 40 CFR 60 Subpart CC.
- Compliance with all testing, reporting, record keeping, and monitoring requirements set forth in 40 CFR 60 Subpart Kb for tank #s 407, 408 and 409.

<u>Permit Waiver AP-CV0 (1/18/00)</u>: The Division issued permit waiver AP-CV0 January 18, 2000 for the installation of a new liquefied petroleum gas (LPG) loading facility and the relocation of an existing LPG tank truck loading facility to the new loading facility location. The waiver noted the applicability of 40 CFR 60 Subpart GGG to new LPG loading facility and the relocated tank truck loading facility and included standard reporting requirements, but contained no other source-specific requirements.

<u>MD-439 (2/19/00)</u>: The Division issued permit MD-439 February 19, 2000 for the installation of 35.7 MMBtu/hr HC Heater H5 (unit 57) at the HC unit. The permit also contained clarifications and/or corrections to several permit conditions in permit MD-410. The applicable source-specific conditions of this permit are summarized below.

- Emission limits for refinery point sources on a pound per hour (lb/hr), ton per year (TPY), and where applicable, lb/MMBtu basis.
- Reference method emission testing for the HC Heater H5 (unit 57) to assess compliance with emission limits.
- Operation of the HC Heater H5 (unit 57) according to the applicable provisions of Chapter 5, Section 2 and 40 CFR 60 Subpart J including compliance with the 0.1 gr/DSCF H_2S concentration limit for the fuel gas fired in the unit.
- The following changes to the permit conditions of permit MD-410:
    - All refinery point sources shall comply with the limits contained in permit MD-439 Table A1.
    - For the sulfur recovery efficiencies for the #1 and #2 SRUs, excess emissions were re-defined as any 24-hour period when the sulfur recovery efficiency drops below 93 percent for the #1 SRU <u>or</u> below 95 percent for the #2 SRU.
    - The annual SO_2 emission limit for the 780 FCC Regenerator (unit 9) was reduced from 811 TPY to 809 TPY.

- Prior to the commencement of operation of all equipment associated with Phase I construction, the point sources modified under permit MD-410 are required to continue to comply with the emission limits set forth in permit CT-1022, Table 1 instead of the new limits contained in permit MD-439, Table A1.
- The permittee is required to continue submitting the monthly fuel oil and SO_2 emission reports (monthly SO_2 bubble reports) for the #8 and #9 High Pressure boilers (units 40 and 41), the Low Pressure Boilers (unit 42), and the #1 and #2 SRUs (units 38 and 39) described in CT-1022. This requirement no longer applied after the commencement of operation of equipment associated with Phase I construction.
- The installation and certification of the NO_x and SO_2 CEMs for the FCC Regenerator (unit 9) is not required until commencement of operation of the HC Unit, H_2 Plant, and all other equipment associated with Phase I construction.
- Operation of the #1, #2, and #3 781 Reformer heaters (units 13, 14, and 15) and the 781 Stabilizer Heater (unit 16) is authorized until the startup of the proposed CCR Heater H1/H2/H3 (unit 54) and CCR Heater H4.

Permit Waiver AP-Y40 (4/5/00): Authorized the operation of a soil vapor extraction system (SVE) at the refinery. The waiver established stack height requirements and required quarterly emissions testing to confirm operation within the levels established for Benzene, BTEX (Benzene, Toluene, Ethyl Benzene and Xylenes), and TVPH (Total Volatile Petroleum Hydrocarbons).

Permit Waiver AP-ZQ0 (7/11/00): Provided for the unloading of toluene at the refinery at tank #306 from railcars. The toluene is used to enhance the octane rating of reformate. The tank is subject to 40 CFR 63, Subpart CC requirements.

Permit Waiver AP-LUI (1/25/01): Allowed the temporary operation of a 76.9 MMBtu/hr natural gas fired boiler until April 25, 2001.

Permit Waiver AP-LVI (1/25/01): Allowed the temporary operation of a 6.7 MMBtu/hr diesel fire boiler until April 22, 2001.

Permit Waiver AP-AD2 (10/30/01): Authorized the replacement of the water draw system on tanks #s 302, 307 and 308 with a single water draw system. The water draw system is subject to the requirements of 40 CFR 60, Subpart QQQ.

Permit MD-701 (12/26/01): Required the installation of pole sleeves on tanks #s 407, 408, and 409.

Permit Waiver AP-XD2 (6/25/02): Authorized the replacement of the top part of the regenerator cyclones on the Fluid Catalytic Cracking Unit (FCCU). The Division confirmed that the replacement would not trigger NSPS requirements for the FCCU.

Permit Waiver AP-HZ2 (1/26/03): Authorized the construction of a land treatment facility for the treatment of contaminated soils.

Permit Waiver AP-0930 (6/19/03): Allowed for enhancements to the hydrogen compressors at the hydrocracker unit to correct performance problems.

WAQSR and Other Applicable Requirements

This section provides a brief overview of the state and federal regulations applicable to the Sinclair Refinery emission sources including those from the Wyoming Air Quality Standards and Regulations, federal new source performance standards (40 CFR 60), federal national emission standards for hazardous air pollutants (40 CFR 63), and other applicable regulations.

WAQSR Chapter 3, Section 2 Opacity Limits

Chapter 3, Section 2(b) limits visible emissions from existing sources to 40 percent opacity. This requirement applies to the units specified in Table I of the draft operating permit. The #5 Generator (unit 49) is limited to 30 percent opacity except for periods not exceeding 10 consecutive seconds per Chapter 3, Section 2(d). For the Tulip Field Flare, Vertical Flare, Light Oil Rack Flare, and proposed HC/CCR Flare, visible emissions from these units are required to be smokeless, i.e. no visible emissions, per WAQSR Chapter 3, Section 6(b)(i). The opacity of visible emissions from all other facility equipment is limited to 20 percent as specified under WAQSR Section 3, Chapter 2(a).

WAQSR Chapter 3, Section 3 NO_X Limits for Fuel Burning Equipment

Chapter 3, Section 3(a)(ii) limits NO_X emissions from existing gas-fired fuel burning equipment to 0.23 pounds per MMBtu heat input. This limit applies to units constructed prior to April 9, 1973, and includes the units specified in Table II of the draft operating permit. NO_X emissions from new gas-fired fuel burning equipment are limited to 0.20 lb/MMBtu heat input per Chapter 3, Section 3(a)(i). This limit applies to all other refinery fuel burning equipment, i.e. the refinery boilers and process heaters. For the #8 High Pressure Boiler, the #9 High Pressure Boiler, and the Low Pressure Boilers (units 40, 41, and 42), the 0.6 lb NO_X per MMBtu heat input limit for existing fuel oil-fired equipment also applies per Chapter 3, Section 3(a)(iv).

40 CFR 60 Standards of Performance for New Stationary Sources

40 CFR 60 Subpart J - Subpart J, Standards of Performance for Petroleum Refineries, applies to fuel gas combustion devices and fluid catalytic cracking unit regenerators constructed after June 11, 1973 and to Claus type sulfur recovery units with capacities greater than 20 LTPD constructed after October 4, 1976. Sources subject to the subpart requirements include the majority of the Sinclair Refinery heaters which are listed in condition P60-J1 of the draft operating permit. For these sources, Subpart J limits the concentration of H_2S in the fuel gas fired to 0.1 gr/dscf and requires continuous monitoring to assess compliance with this limit. The permittee operates a continuous H_2S monitoring system for the refinery fuel gas system to comply with this requirement. The FCC Unit is not subject to the requirements of Subpart J as it was not constructed, modified or reconstructed after June 11, 1973. When this permit was placed on public notice and EPA review in late 2000, the EPA challenged a New Source Performance Standard determination that the Division had made in 1993. As a result, the Division is requiring that Sinclair comply with Subpart J

requirements for the Claus sulfur recovery plant. The company is on a compliance schedule for meeting these requirements.

40 CFR 60 Subparts K and Ka - Tank 507 and Tanks 531 and 532 are subject to the requirements of 40 CFR 60 Subparts K and Ka, respectively, based on size, contents, and date of construction. However, pursuant to 40 CFR 63 Subpart CC 63.640(n)(5), these storage tanks are required to comply only with the provisions of Subpart CC.

40 CFR 60 Subpart Kb - Based on size, contents, and date of construction, tanks 407, 408, and 409 at the refinery are subject to the provisions of 40 CFR 60 Subpart Kb. These tanks are also potentially subject to 40 CFR 63 Subpart CC. However, per 63.640(n)(1), each storage tank is required to comply only with the provisions of Subpart Kb. Subpart Kb contains specific design requirements and additional testing, monitoring, recordkeeping, and reporting requirements to ensure VOC emissions are controlled.

40 CFR 60 Subpart GGG - Based on date of construction, the #2 SRU, the #3 HDS, the HC Unit, and the H_2 Plant are currently subject to 40 CFR 60 Subpart GGG, Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries. As a BACT requirement, permit MD-410 requires all process equipment from these units not subject to 40 CFR 63 Subpart CC or 40 CFR 60 Subpart GGG and not in heavy liquid service to comply with the requirements of Subpart GGG.

40 CFR 60 Subpart QQQ - Based on date of construction, the new oily water collection system, sewer, and separator tank (the hydrocracker drain system, the hydrocracker unit lift station, the desalter discharge for the 581 and 582 Crude Units, and Tanks 38 and 39) are subject to 40 CFR 60 NSPS Subpart QQQ, Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems. The existing oily water system remains in operation and predates the Subpart QQQ requirements.

<u>40 CFR 61 Subpart FF, National Emission Standard for Benzene Waste Operations</u>

40 CFR 61 Subpart FF - The refinery wastewater systems are subject to the requirements of 40 CFR 61 Subpart FF, National Emission Standards for Benzene Waste Operations, which applies to hazardous waste treatment, storage, and disposal facilities processing refinery hazardous waste. The permittee is in compliance with Subpart FF requirements and is therefore in compliance with the wastewater provisions of 40 CFR 63 Subpart CC, 63.647 which also apply. Sinclair is required to repeat the determination of total annual benzene quantity from facility waste as required in 40 CFR 61.355(a)(4)(ii).

<u>40 CFR 63 National Emission Standards for Hazardous Air Pollutants</u>

40 CFR 63 Subpart CC, National Emission Standards for Hazardous Air Pollutants (NESHAP). Subpart CC contains specific emission control, monitoring, recordkeeping, reporting, and other requirements for new and existing miscellaneous process vents from refinery process equipment, process unit storage vessels, refinery wastewater streams and treatment operations, process unit equipment leaks, and gasoline loading racks.

40 CFR 63 Subpart UUU, National Emission Standards for Hazardous Air Pollutants (NESHAP). Subpart UUU contains specific emission control, monitoring, recordkeeping, reporting, and other requirements for new and existing fluid catalytic cracking units, catalytic reformers, sulfur recovery plants, and any bypass line(s) serving these units.

40 CFR 63 Subpart EEEE and Subpart GGGGG, National Emission Standards for Hazardous Air Pollutants (NESHAP) for Organic Liquids Distribution and Site Remediation respectively may apply to the Sinclair Wyoming Refinery, but the status is currently uncertain. The Division will modify the operating permit to add these requirements within the next 18 months if necessary.

40 CFR 64 Compliance Assurance Monitoring

Requirements for compliance assurance monitoring (CAM) under 40 CFR part 64 are not applicable to any facility sources at this time.

Periodic Monitoring

WAQSR Chapter 6, Section 3(h)(i)(C)(I) requires operating permits issued by the Division to contain periodic monitoring requirements for applicable requirements. Where periodic monitoring is not specified by an applicable requirement, periodic monitoring methods are established according to the applicable Division periodic monitoring guidance documents.

Visible Emissions Monitoring

Method 9 Observations - The operating permit requires the permittee to monitor visible emissions from the 780 FCC Regenerator (unit 9) twice daily using Method 9. The first measurement is required between 6:00 a.m. and Noon, and the second observation is required between Noon and 6:00 p.m. A minimum of one hour is required between the two observations unless observations covering the intervening hour are made. For the Sulfur Recovery Units #1 and #2 (units 38 and 39), #8 and #9 High Pressure Boilers (unit 40 and 41), Low Pressure Boilers (unit 42), and #5 Generator (unit 49), the operating permit requires the permittee to monitor visible emissions quarterly using Method 9.

Method 22 Observations - The operating permit requires the permittee to monitor visible emissions from the Tulip Field Flare (unit 36), Vertical Flare (unit 37), and Light Oil Rack Flare (unit 43B) monthly using Method 22.

In lieu of periodic monitoring for visible emissions from all other refinery heaters and the #10 High Pressure Boiler (unit 35), the permittee is required to monitor the type of fuel used in each unit to ensure refinery fuel gas or natural gas are the sole fuel sources for these units.

Particulate Emissions Monitoring

Method 5 Testing - The operating permit requires the permittee to measure particulate emissions from the 780 FCC Regenerator (unit 9) annually using Method 5. For the #8 High Pressure Boiler (unit 40) and #9 High Pressure Boiler (unit 41), Method 5 testing is required once during the permit term.

Operation/Maintenance According to Manufacturer's Recommendations - For the Low Pressure Boilers (unit 42), the operating permit requires periodic monitoring in the form of operation and maintenance of each unit in accordance with the manufacturer's specifications and recommendations in lieu of direct particulate emission measurements.

For all other sources, periodic monitoring is not required since particulate emissions from these sources are of trivial environmental importance.

<u>NO_X Emissions Monitoring</u>

Continuous NO_X Emissions Monitoring - The operating permit requires the permittee to install, certify, operate, and maintain a continuous in-stack monitoring system for measuring NO_X emissions from the 780 FCC Regenerator (unit 9). The NO_X emission monitor has been installed and certified and must meet the quality assurance requirements of 40 CFR 60, Appendix F. The permittee is also required to develop for Division approval a quality assurance program for the NO_X emissions monitor.

Emissions Testing - For the #10 High Pressure Boiler (unit 35), #8 High Pressure Boiler (unit 40), #9 High Pressure Boiler (unit 41), and Low Pressure Boilers (unit 42), the operating permit requires periodic monitoring in the form of annual NO_X emissions testing using Method 7 of 40 CFR 60 Appendix A to assess compliance with the applicable NO_X emission limits. For the following units, NO_X emissions testing is required at least once during the permit term for compliance assessment purposes: the 780 FCC Heater B2 (unit 1), 781 Naphtha Splitter Heater (unit 10), 781 #1 Reformer Heater (unit 13), 781 #2 Reformer Heater (unit 14), 581 Crude Heater #1 (unit 18), 581 Crude Heater #2 (unit 19), 583 Vacuum Heater (unit 20), 582 Crude Heater-F102A (unit 23), 582 Vacuum Heater-F104 (unit 25), Alky Heater B16 (unit 33), HC Heater H3 (unit 51), H_2 Plant H-101 Heater (unit 53), and the #5 Generator (unit 49).

Portable Analyzer Monitoring - The operating permit allows the permittee to substitute portable analyzer emissions testing, as described in this paragraph, for the required NO_X emissions testing previously described. For the #10 High Pressure Boiler (unit 35), #8 High Pressure Boiler (unit 40), #9 High Pressure Boiler (unit 41), and Low Pressure Boilers (unit 42), the permittee has the option of conducting semi-annual NO_X emissions testing using a portable analyzer to assess compliance with the applicable NO_X emission limits. The testing must be conducted following the Division's portable analyzer monitoring protocol contained in Appendix A of the draft operating permit. Annual portable analyzer testing for NO_X emissions may be conducted in lieu of Method 7 testing for the following units: the 780 FCC Heater B2 (unit 1), 781 Naphtha Splitter Heater (unit 10), 781 #1 Reformer Heater (unit 13), 781 #2 Reformer Heater (unit 14), 581 Crude Heater #1 (unit 18), 581 Crude Heater #2 (unit 19), 583 Vacuum Heater (unit 20), 582 Crude Heater-F102A (unit 23), 582 Vacuum Heater-F104 (unit 25), Alky Heater B16 (unit 33), HC Heater H3 (unit 51), H_2 Plant H-101 Heater (unit 53), the HC Heater H3 (unit 51), and the H_2 Plant H-101 Heater (unit 53).

Operation/Maintenance According to Manufacturer's Recommendations - For all remaining units, the operating permit requires periodic monitoring in the form of operation and maintenance of each unit in accordance with the manufacturer's specifications and recommendations, or if unavailable, good maintenance practice in lieu of direct NO_X emission measurements.

<u>SO_2 Emissions, H_2S, and Sulfur Monitoring</u>

Continuous SO_2 Emissions Monitoring - The operating permit requires the permittee to install, certify, operate, and maintain a continuous in-stack monitoring system for measuring SO_2 emissions from the 780 FCC Regenerator (unit 9). The SO_2 emission monitor shall be installed and certified, and must meet the quality assurance requirements of 40 CFR 60, Appendix F. The permittee is also required to develop for Division approval a quality assurance program for the SO_2 emissions monitor. For the Sulfur Recovery Units #1 and #2 (units 38 and 39), the operating permit requires the permittee to continue to maintain and operate the existing monitors for monitoring SO_2 emissions on a lb/hr basis and comply with the requirements of 40 CFR 60, Appendix F. Monitoring must also comply with Subpart J requirements.

Sulfur Recovery Unit Sulfur Conversion Efficiency - The operating permit requires the permittee to conduct the following monitoring to determine compliance with the sulfur recovery efficiency limits contained in condition F6 of the draft permit:

- The permittee is required to maintain and operate the installed H_2S analyzers and acid gas flow meters in order to determine the sulfur flow rates into the #1 and #2 Sulfur Recovery Units.
- The permittee is required to monitor the volume of liquid sulfur produced by the #1 and #2 Sulfur Recovery units using the level gauges installed at the #1SRU and #2SRU sulfur pits. Measurements of the liquid sulfur level will be made on a daily basis, at minimum, from each sulfur pit as well as before and after any sulfur loading operations.

The daily sulfur recovery efficiency for each SRU will be calculated by dividing the total sulfur production per day unit by the total unit sulfur input per day.

Periodic monitoring of SO_2 emissions from the #5 Generator (unit 49) is not required since SO_2 emissions from this source are of trivial environmental importance.

Fuel Gas H_2S Monitoring - The operating permit requires the permittee to continue to maintain and operate the existing continuous H_2S monitor for the refinery fuel gas system. The monitor must also comply with the requirements of 40 CFR 60, Appendix F. This system monitors both the high pressure and low pressure fuel gas lines. For the refinery boilers, the operating permit requires the permittee to monitor both the fuel gas usage at the refinery boilerhouse. For monitoring fuel gas, the permittee is required to calibrate and maintain fuel gas meters in accordance with manufacturer's recommendations.

Fuel Oil Monitoring - For the refinery boilers, the operating permit requires the permittee to monitor the fuel oil usage at the refinery boilerhouse. Fuel oil usage is to be determined using the down-gauging method, i.e. measuring the difference in the fuel oil surface height of the fuel oil storage tanks, every four hours. The operating permit also requires an analysis of the fuel oil characteristics using American Petroleum Institute (API) methods and a determination of the fuel oil sulfur content each time a fuel oil storage tank has been filled for use.

Ambient Monitoring

The permittee currently operates an ambient air monitoring system consisting of a meteorological station and one SO_2 monitor for measuring the ambient concentrations of SO_2 northeast of the refinery. The draft operating permit requires the permittee to continue to operate this monitoring system in a manner acceptable to the Division and in accordance with 40 CFR 60 Parts 50 and 58.